



SILVER LEVEL CHALLENGE #5



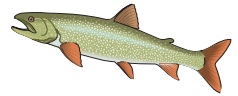
Calculators may be used.

Name _____

1. $\frac{1}{6}$ What is the positive difference between $\frac{1}{6}$ of 3 and $\frac{2}{7}$ of $2\frac{1}{3}$? Express your answer as a common fraction.

The value of $\frac{1}{6}$ of 3 is $(\frac{1}{6})(3) = \frac{1}{2}$. The value of $\frac{2}{7}$ of $2\frac{1}{3}$ is $(\frac{2}{7})(2\frac{1}{3}) = (\frac{2}{7})(\frac{7}{3}) = \frac{2}{3}$. The difference between these two values is $\frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} = \frac{1}{6}$.

2. **500** eggs Of the eggs produced by salmon, 80% hatch, and of those, 25% survive to migrate to the ocean. How many eggs are needed to produce 100 salmon that migrate to the ocean?



Assuming we begin with x eggs produced by salmon, we are told 80% of them hatch, which means $(0.80)x$ eggs hatch. Of these, 25% migrate to the ocean, so $(0.25)(0.80)x$ salmon migrate to the ocean. If this number is equal to 100, how many eggs did we start with? That question can be represented as $(0.25)(0.80)x = 100$. It may be easier to use a fraction representation of these decimals: $(\frac{1}{4})(\frac{4}{5})x = 100$. This simplifies to $\frac{1}{5}x = 100$. Multiplying both sides by 5 results in $x = 500$.

3. **486** A geometric sequence of positive integers is formed for which the first term is 2 and the fifth term is 162. What is the sixth term of the sequence?

In a geometric sequence, each term after the first is the product of the previous term and a common ratio. We don't know what that common ratio is for this sequence, so let's let the ratio be y . Based on the information in the question, we can represent the first six terms of the sequence as 2, $2y$, $2y^2$, $2y^3$, $2y^4$, $2y^5$. However, we know that the fifth term is 162, so $2y^4 = 162$. Dividing both sides by 2, we have $y^4 = 81$. Taking the fourth root of 81 yields $y = 3$. The sixth term is then $(162)(3) = \mathbf{486}$.

4. **45** points

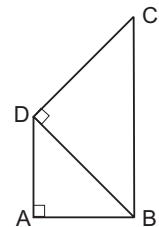
In a basketball game, Marla scored twice as many points as Tim. Marla scored exactly $\frac{4}{5}$ as many points as Scott. If none of the three of them scored less than 17 points, what is the fewest number of points Scott could have scored?



Note that one can only score a whole number of points. So when Marla scored exactly $\frac{4}{5}$ of Scott's, that tells us Scott's number of points was a multiple of 5 and Marla's number of points was a multiple of 4. From the information, we can see that Scott scored the most, then Marla scored the next-highest amount, and Tim scored the fewest. If we assume Tim scored the minimum 17 points, then Marla scored 34 points, and this is not a multiple of 4. However, if Tim scored 18 points, then Marla scored 36 points, which is a multiple of 4. Scott scored $\frac{5}{4}$ the number of points as Marla, so Scott scored $(\frac{5}{4})(36) = 45$ points.

5. **$4 + \sqrt{2}$** units

Each triangle in this figure is an isosceles right triangle. The length of segment BC is 2 units. What is the number of units in the perimeter of quadrilateral ABCD? Express your answer in simplest radical form.



In any isosceles right triangle (45-45-90 triangle), there is a relationship where the hypotenuse is the product of the leg and $\sqrt{2}$. So if you know the leg length, multiply by $\sqrt{2}$ to get the hypotenuse length. And if you know the hypotenuse length, divide by $\sqrt{2}$ to get the leg length. Segment BC is the hypotenuse of triangle CDB, so legs BD and CD are $2 \div \sqrt{2} = \sqrt{2}$ units. Because segment BD is also the hypotenuse of triangle BAD, legs AB and AD are each $\sqrt{2} \div \sqrt{2} = 1$ unit. Therefore, the perimeter of quadrilateral ABCD is the sum of its four sides: $1 + 2 + \sqrt{2} + 1 = 4 + \sqrt{2}$ units.